Who is experiencing differential impact from HIV/AIDS? Technical notes and data tables

Recent changes to the presentation of Massachusetts HIV/AIDS surveillance data

Effective January 1, 2011, the Massachusetts Department of Public Health (MDPH), Bureau of Infectious Diseases, HIV/AIDS fact sheets, epidemiologic reports and other HIV data presentations have been updated to remove all HIV/AIDS cases that were first diagnosed in another state before being reported in Massachusetts. As of January 1, 2014, this resulted in the removal of 4,135 HIV/AIDS cases, of which 973 have died and 3,162 were living. These persons living with HIV/AIDS may still continue to reside and receive care in the Commonwealth. The total number of persons living with HIV/AIDS, irrespective of location at diagnosis, is the basis for MDPH service planning. This change is partially a result of increased activities required by the Centers for Disease Control and Prevention (CDC) for de-duplication among states in an effort to identify cases that are counted multiple times in the National HIV/AIDS Surveillance System. The cases are assigned to the state that reports the earliest date of AIDS diagnosis if available. If the case has not progressed to AIDS, the case is assigned to the state with the earliest HIV diagnosis date. Please note that previous HIV/AIDS fact sheets, data reports and presentations included cases that may have been first diagnosed in another state.

Also effective January 1, 2011, the MDPH HIV/AIDS fact sheets, epidemiologic reports, and other data presentations have been updated to eliminate the presumed heterosexual risk category for men; those cases have been reassigned to the no identified risk (NIR) category. The presumed heterosexual reported risk category was used with the intention of identifying HIV risk for women when sex with men is the only reported risk factor, there is no evidence of current or past injection drug use (IDU), and behavioral risk and HIV status information about male sexual partners are unknown. Twenty-nine percent of women living with HIV/AIDS and 40% of recent female HIV diagnoses are reported in the presumed heterosexual risk category. The application of the presumed heterosexual risk category to men is overly inclusive in that woman to man HIV transmission is biologically less probable, and there are alternate reported risks that are possible for men, including sex with other men (MSM) or IDU. The CDC reports men diagnosed with HIV/AIDS who report sex with women as their only risk factor, without corresponding partner risk or HIV status information, in the NIR category. This revision to report presumed heterosexual male HIV/AIDS cases as NIR will bring Massachusetts HIV/AIDS case reporting for men in alignment with CDC standards. The MDPH will maintain presumed heterosexual and heterosexual risk categories for women.

Explanation of Estimated Rates for MSM and non-MSM

Estimated MSM Prevalence Rate: An estimate of the proportion of MSM that are currently living with HIV/AIDS. The numerator is the number of MSM who are living with HIV/AIDS as of a specific date and the denominator is the estimated size of the MSM population. The size of the MSM population in Massachusetts was estimated by multiplying the average proportion of men, ages 18-64 years, reporting same-sex partner (or opposite and same-sex partner), on the 2011 and 2012 Massachusetts BRFSS (4.9%), by the number of 18 to 64 year old men in Massachusetts as reported in the 2010 Census (2,064,804), to get 101,175. The prevalence rate in MSM is calculated by the formula:

HIV/AIDS prevalence rate for MSM as of 1/1/14	= (number of MSM living with HIV/AIDS on 1/1/14÷ estimated population size of MSM)×100,000 = ((7,206/(.049×2,064,804))×100,000 = (7,206/101,175)×100,000 = 0.0712228494761711×100,000 = **7,122.3 per 100,000**

Estimated non-MSM Prevalence Rate: An estimate of the proportion of non-MSM that are currently living with HIV/AIDS used as a basis of comparison to the MSM prevalence rate. The numerator is the number of non-MSM who are living with HIV/AIDS as of a specific date and the denominator is the estimated size of the non-MSM population. The size of the non-MSM population in Massachusetts was estimated by multiplying the average proportion of men, ages 18-64 years, reporting sex with only women, on the 2011 and 2012 Massachusetts BRFSS (95.1%) by the number of 18 to 64 year old men in Massachusetts as reported in the 2010 Census (2,064,804), to get 1,963,629. The prevalence rate in non-MSM is calculated by the formula:

HIV/AIDS prevalence rate for non-MSM as of 1/1/14	= (number of non-MSM living with HIV/AIDS on 1/1/14÷ estimated population size of non-MSM)×100,000 = ((5,330/(.951×2,064,804))×100,000 = (5,330/1,963,629)×100,000 = 0.0027143625781079 7×100,000 = **271.4 per 100,000**

Estimated Average Annual MSM HIV Diagnosis Rate: An estimate of the average proportion of MSM that are diagnosed with HIV infection over a three-year period. The numerator is the average number of MSM who were diagnosed with HIV infection over the three-year period and the denominator is the estimated size of the MSM population. The size of the MSM population in Massachusetts was estimated by multiplying the average proportion of men, ages 18 to 64 years, reporting same-sex partner (or opposite and same-sex partner) on the 2011 and 2012 Massachusetts BRFSS (4.9%), by the number of 18 to 64 year old men in Massachusetts as reported in the 2010 Census (2,064,804), to get 101,175. The estimated HIV diagnosis rate in MSM is calculated by the formula:

Average annual HIV diagnosis rate among MSM, 2010–2012	(((number of MSM diagnosed with HIV infection in 2010 + number of MSM diagnosed with HIV infection in 2011 + number of MSM diagnosed with HIV infection in 2012) ÷ 3) ÷ estimated population size of MSM) × 100,000 = ((930÷ 3)/(.049×2,064,804))×100,000 = (310/101,175)×100,000 = 0.003064 ×100,000 = **306.4 per 100,000**

Estimated Average Annual non-MSM HIV Diagnosis Rate: An estimate of the average proportion of non-MSM that are diagnosed with HIV infection over a three-year period used as a basis of comparison to the MSM diagnosis rate. The numerator is the average number of non-MSM who were diagnosed with HIV infection over the three-year period and the denominator is the estimated size of the non-MSM population. The size of the non-MSM population in Massachusetts was estimated by multiplying the average proportion of men, ages 18 to 64 years, reporting sex with only women on the 2011 and 2012 Massachusetts BRFSS (95.1%), by the number of 18 to 64 year old men in Massachusetts as reported in the 2010 Census (2,064,804), to get 1,963,629. The estimated HIV diagnosis rate in non-MSM is calculated by the formula:

Average annual HIV diagnosis rate among non-MSM, 2010–2012	(((number of non-MSM diagnosed with HIV infection in 2010 + number of non-MSM diagnosed with HIV infection in 2011 + number of non-MSM diagnosed with HIV infection in 2012) ÷ 3) ÷ estimated population size of non-MSM) × 100,000 = ((531÷ 3)/(.951×2,064,804))×100,000 = (177/1,963,629)×100,000 = 0.00009014 ×100,000 = **9.0 per 100,000**

Explanation of age adjusted rates

A “rate” of a disease per 100,000 population is a useful way to compare groups that have substantially different population sizes rather than relying on the raw number of cases. For example, the number of people living with HIV/AIDS on December 31, 2013 who are Hispanic/Latino, is 4,665 whereas the number of people living with HIV/AIDS who are white (non-Hispanic) is 8,297. Although the *number* of people living with HIV/AIDS who are Hispanic/Latino in Massachusetts is smaller than the number of people living with HIV/AIDS who are white (non-Hispanic), we also need to consider that there are far fewer people of Hispanic/Latino heritage living in Massachusetts than white (non-Hispanic) individuals. Hispanic/Latino individuals represent 10% of the Massachusetts population compared to white (non-Hispanic) individuals who represent 78% of the population[1]. If HIV/AIDS had the same impact on the Hispanic/Latino population of the state as on the white (non-Hispanic), then there should be eight times as many cases in white (non-Hispanic) individuals, but there are less than twice as many. By calculating a rate which takes into consideration the differences in the population size, it is evident that the number of people living with HIV/AIDS for every 100,000 Hispanic/Latino individuals in Massachusetts is much higher than the rate for every 100,000 white (non-Hispanic) individuals. This is called a "crude rate" and is calculated by dividing the number of people living with HIV/AIDS by the population of interest (the total number of Hispanic/Latino individuals in Massachusetts, for example) and multiplying by 100,000. (See example 1.A below).

Example 1.A: Calculation of crude HIV/AIDS prevalence rate for white (non-Hispanic) individuals, Massachusetts (161.7 per 100,000)

Crude HIV/AIDS prevalence rate for white (non-Hispanic) individuals	= (number of white (non-Hispanic) individuals living with HIV/AIDS ÷ population size of white (non-Hispanic) individuals)×100,000 = (8,297/5,132,633)×100,000 = (.0001616519)×100,000 = **161.7**

However, sometimes, in addition to the population size being different, the age composition of the populations is different. In Massachusetts, black (non-Hispanic) and Hispanic/Latino populations are generally younger than white (non-Hispanic). The median age of black (non-Hispanic) people (29.7 years) and Hispanic/Latino people (24.5 years) is younger than that of white (non-Hispanic) people (38.8 years). Therefore, it is necessary to “age-adjust” the HIV/AIDS prevalence rate to get a true comparison of the impact of the disease across racial/ethnic groups without an effect from the

[1] The denominators for prevalence calculations are based on year 2010 population estimates from the MDPH Bureau of Health Information, Statistics, Research and Evaluation

differences in age composition. Age-adjustment of rates minimizes the distortion created by differences in age composition.

Age-adjusted rates are calculated by weighting the age-specific rates for a given population by the age distribution of a standard population. The weighted age-specific rates are then added to produce the adjusted rate for all ages combined. (See example 1.B below).

Example 1.B: Calculation of age-adjusted HIV/AIDS prevalence rate for white (non-Hispanic) individuals, Massachusetts (137.5 per 100,000)

A	*B*	*C*	*D*	*E*
Age group (in years)	*# of prevalent HIV/AIDS cases*	*Population (2010)*	*2000 US standard population weight*	*Age-adjusted rate ((B÷C×D)×100,000))*
<1	0	48,010	0.013818	0.00
1-4	0	200,452	0.055317	0.00
5-14	4	571,967	0.145565	0.10
15-24	89	677,899	0.138646	1.82
25-34	500	603,245	0.135573	11.24
35-44	1133	676,064	0.162613	27.25
45-54	3446	841,315	0.134834	55.23
55-64	2393	697,852	0.087247	29.92
65-74	625	403,518	0.066037	10.23
75-84	101	275,380	0.044842	1.64
85+ years	6	136,931	0.015508	0.07
Total	8,297	5,132,633	1.000000	**137.5**

To see the effect of age-distribution on prevalence rates see Tables 1 and 3 below for a comparison of crude and age-adjusted rates by race/ethnicity.

Table 1. Crude and age-adjusted HIV/AIDS prevalence per 100,000 population[1] on December 31, 2013 by race/ethnicity and gender: Massachusetts[2]

State Total:	Crude rate per 100,000	Age-adjusted rate per 100,000
White, non-Hispanic	161.7	137.5
Black, non-Hispanic	1,383.0	1,416.4
Hispanic/Latino	743.2	959.3
Asian/Pacific Islander	91.8	94.1
Total prevalence	**292.7**	**266.3**
Men:	**Crude rate per 100,000**	**Age-adjusted rate per 100,000**
White, non-Hispanic	279.4	235.7
Black, non-Hispanic	1,611.9	1,694.7
Hispanic/Latino	1,031.8	1,409.4
Asian/Pacific Islander	147.0	150.8
Total prevalence among men	**432.0**	**389.8**
Women:	**Crude rate per 100,000**	**Age-adjusted rate per 100,000**
White, non-Hispanic	51.6	45.4
Black, non-Hispanic	1,169.2	1,181.8
Hispanic/Latina	465.0	573.9
Asian/Pacific Islander	41.1	42.5
Total prevalence among women	**162.2**	**151.6**

[1] The denominators for rate calculations are from the MDPH Massachusetts Race Allocated Census 2010 Estimates (MRACE 2010), Massachusetts Department of Public Health, Bureau of Health Information, Statistics, Research, and Evaluation

[2] Effective, January 1, 2011 the Massachusetts Department of Public Health, HIV/AIDS fact sheets, epidemiologic reports, and other data presentations have been updated to remove all HIV/AIDS cases that were first diagnosed in another state before being reported in Massachusetts.

Data Source: MDPH HIV/AIDS Surveillance Program; Data as of 1/1/14

Table 2. Age-adjusted HIV/AIDS prevalence rate per 100,000 population[1] on December 31, 2013 by race/ethnicity and Health Service Region (HSR):[2] Massachusetts[3]

	Boston	Central	Metro West	North-east	South-East	Western	State Total
White NH	617.0	81.4	96.4	108.4	119.0	86.4	137.5
Black NH	1,509.0	1,454.1	1,430.3	1,534.6	928.5	969.5	1,416.4
Hispanic/ Latino	1,032.9	857.5	614.9	672.5	959.6	1,171.1	959.3
API	150.4	90.7	48.8	132.4	82.4	98.9	94.1
Total	**830.8**	**171.1**	**166.1**	**213.0**	**180.0**	**233.5**	**266.3**

[1] The denominators for rate calculations are from the MDPH Massachusetts Race Allocated Census 2010 Estimates (MRACE 2010), Massachusetts Department of Public Health, Bureau of Health Information, Statistics, Research, and Evaluation; all rates are age-adjusted using the 2000 US standard population.
[2] Reflects the health service region of a person's residence at the time of report (not necessarily current residence); See Epidemiologic Profile General Appendices, Health Service Region Maps, available at http://www.mass.gov/dph/aids/research/profile2006/app5_hrs_maps.pdf for configuration of health service regions
[3] Effective January 1, 2011, the Massachusetts Department of Public Health, HIV/AIDS fact sheets, epidemiologic reports, and other data presentations have been updated to remove all HIV/AIDS cases that were first diagnosed in another state before being reported in Massachusetts.
[4] Rates calculated from numerators less than 5 for localities with populations of less than 50,000 are suppressed for the assurance of confidentiality.
NH = non-Hispanic, API = Asian/Pacific Islander
Data Source: MDPH HIV/AIDS Surveillance Program; Data as of 1/1/14

Table 3. Crude and age-adjusted rates of diagnosis of HIV infection per 100,000 population[1] by race/ethnicity and gender: Average annual rate 2010–2012[2], Massachusetts[3]

State total:	Crude rate per 100,000	Age-adjusted rate per 100,000
White (non-Hispanic)	5.0	5.1
Black (non-Hispanic)	53.4	52.7
Hispanic/Latino	28.3	29.8
Asian/Pacific Islander	6.1	5.4
Total rate	**10.5**	**10.6**
Men:	**Crude rate per 100,000**	**Age-adjusted rate per 100,000**
White (non-Hispanic) Men	9.1	9.0
Black (non-Hispanic) Men	60.1	59.3
Hispanic/Latino Men	43.1	45.3
Asian/Pacific Islander Men	10.5	9.2
Total rate among men	**15.8**	**15.7**
Women:	**Crude rate per 100,000**	**Age-adjusted rate per 100,000**
White (non-Hispanic) Women	1.3	1.4
Black (non-Hispanic) Women	47.0	46.5
Hispanic/Latina Women	14.1	15.4
Asian/Pacific Islander Women	2.1	1.8
Total rate among women	**5.5**	**5.6**

[1] The denominators for rate calculations are from the MDPH Massachusetts Race Allocated Census 2010 Estimates (MRACE 2010), Massachusetts Department of Public Health, Bureau of Health Information, Statistics, Research, and Evaluation

[2] Reflects year of HIV infection diagnosis among all individuals reported with HIV infection, with or without an AIDS diagnosis for the most recently available three-year period after the implementation of HIV infection reporting in 1999.

[3] Effective, January 1, 2011 the Massachusetts Department of Public Health, HIV/AIDS fact sheets, epidemiologic reports, and other data presentations have been updated to remove all HIV/AIDS cases that were first diagnosed in another state before being reported in Massachusetts.

Data Source: MDPH HIV/AIDS Surveillance Program; Data as of 1/1/14

Table 4. Age-adjusted rate of HIV diagnosis per 100,000 population[1] by race/ethnicity and Health Service Region (HSR):[2] Average annual rate 2010–2012,[3] Massachusetts[4]

	Boston	Central	Metro West	North-east	South-East	Western	State Total
White NH	16.8	3.0	3.8	4.6	4.5	4.5	5.1
Black NH	51.0	62.6	49.6	64.1	45.2	40.3	52.7
Hispanic/ Latino	36.1	22.9	24.3	24.4	23.0	33.1	29.8
API	8.0	4.7	3.0	6.8	6.1	5.7	5.4
Total	**26.2**	**7.1**	**7.1**	**9.6**	**7.5**	**9.8**	**10.6**

[1] The denominators for rate calculations are from the MDPH Massachusetts Race Allocated Census 2010 Estimates (MRACE 2010), Massachusetts Department of Public Health, Bureau of Health Information, Statistics, Research, and Evaluation; all rates are age-adjusted using the 2000 US standard population.
[2] Reflects the health service region of a person's residence at the time of report (not necessarily current residence); See Epidemiologic Profile General Appendices, Health Service Region Maps, available at http://www.mass.gov/dph/aids/research/profile2005/app5_hrs_maps.pdf for configuration of health service regions
[3] Reflects year of HIV infection diagnosis among all individuals reported with HIV infection, with or without an AIDS diagnosis for the most recently available three-year period after the implementation of HIV infection reporting in 1999.
[4] Effective January 1, 2011, the Massachusetts Department of Public Health, HIV/AIDS fact sheets, epidemiologic reports, and other data presentations have been updated to remove all HIV/AIDS cases that were first diagnosed in another state before being reported in Massachusetts.
NH = non-Hispanic, API = Asian/Pacific Islander
Data Source: MDPH HIV/AIDS Surveillance Program, data as of 1/1/14

Table 5. Rate of HIV diagnosis per 100,000 population[1] by gender and age at HIV diagnosis: Massachusetts[2], 2010–2012[3]

Age (years):	Men	Women	Total
Under 13	0.3	0.4	0.4
13 to 24	11.9	3.9	7.9
25 to 29	28.6	7.0	17.7
30 to 34	29.4	14.5	21.8
35 to 39	31.7	13.1	22.2
40 to 44	31.6	9.6	20.3
45 to 49	29.8	9.2	19.3
50 to 54	19.9	6.5	13.0
55 to 59	13.7	5.5	9.5
60+	4.3	2.0	3.0
Total	**15.8**	**5.5**	**10.5**

[1] The denominators for rate calculations are from the 2010 Census, SF1; rates are age-specific and not age-adjusted.
[2] Effective, January 1, 2011 the Massachusetts Department of Public Health, HIV/AIDS fact sheets, epidemiologic reports, and other data presentations have been updated to remove all HIV/AIDS cases that were first diagnosed in another state before being reported in Massachusetts.
[3] Reflects year of HIV infection diagnosis among all individuals reported with HIV infection, with or without an AIDS diagnosis for the most recently available three-year period after the implementation of HIV infection reporting in 1999.
Data Source: MDPH HIV/AIDS Surveillance Program (percentages may not add up to 100% due to rounding); Data as of 1/1/14